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UNDERSTANDING DEEP ATLANTIC ECOSYSTEMS

# WP5 Valuing Ecosystem Services

## Atlas General Assembly Mallorca 2019

WP Leader: Claire W. Armstrong, UiT The Arctic University of Norway

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# WP5 Objectives

1. Assess and evaluate goods and services provided by the Atlantic Case Study areas in order to understand and predict future changes in socioeconomic value.
2. Determine the public's willingness to pay for the protection of selected Atlantic Case Study areas and their ecosystem services in light of present-day and the potential of future economic exploitation of Europe's deepwater ecosystems.
3. Provide economic and social context to ATLAS adaptive management planning.

# Partners involved

- UTR, NUIG, Iodine, IMAR-UAz
- MSS, NIOZ, UCD, IEO, DFO, UNCW







# Deliverables

| Number | Deliverable Title and Description | Month |
|---|---|---|
| D5.1 | Comprehensive inventory of existing and potential ecosystem services in Atlantic areas | M18 |
| D5.2 | Expert assessment of ecosystem services risks and pressures in case study areas | M18 |
| D5.3 | Analysis of validity, legitimacy and acceptability of valuation methods | M36 |
| D5.4 | Report on willingness to pay for conservation in four Atlantic countries | M42 |
| D5.5 | Report on ocean monetary values and adaptive management and trade-offs | M42 |

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1 Tinch: “Debating Nature’s Value: The Role of Monetary Valuation” in Anderson (ed) 2018 Debating Nature's Value: The Concept of 'Natural Capital’, Palgrave. ISBN 978-3-319-99244-0

frontiers in Marine Science

ORIGINAL RESEARCH
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# Trading Off Co-produced Marine Ecosystem Services: Natural Resource Industries Versus Other Use and Non-use Ecosystem Service Values

*Margrethe Aanesen and Claire W. Armstrong**

*Norwegian College of Fishery Science, UiT The Arctic University of Norway, Tromsø, Norway*

Ecosystem services (ESs) may be both non-market and market based. Both may provide important input to societal welfare. Using natural resources, or converting nature in the development of market based ES may impact the access to non-market or more conservationist ES, and vice versa. How does the general public trade-off between these two types of ES? We use two valuation studies in Northern Norway to identify the public's preferences for marine industries versus other marine use and non-use values. One study assesses willingness to pay to protect cold-water corals, a relatively abundant, and to some degree, protected resource off the coast of Norway. The other study elicits people's willingness to pay for stricter regulations of industrial activity in the coastal zone, providing more coastal area for recreational activities. Both studies show strong conservation preferences, and willingness to forego blue industrial growth. However, these preferences are heterogeneous across socio-economic characteristics, and, interestingly, educational level is the characteristic that most distinctly separates the population into various preference groups.

**Keywords: ecosystem services, Arctic, Norway, conversion, conservation**

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## INTRODUCTION

There is a substantial push to increase the potential commercial output, or more specifically blue growth, from marine environments worldwide (EU, 2017; WB/UN, 2017). FAO defines Blue Growth as “Sustainable growth and development emanating from economic activities using living renewable resources of the oceans, wetlands, and coastal zones that minimize environmental degradation, biodiversity loss and unsustainable use of aquatic resources, and maximize economic and social benefits.” The marine commercial production, whether sustainable or not, is usually co-produced alongside other ecosystem services (ESs), which humans benefit from, and some of these services are traded-off against the commercial output, either directly or via allocation of space. Marine scientists, both natural and social, have long been sounding the warning bell with regards to economic growth plans in marine environments and the potential impacts on ecosystems and their services (Barbier et al., 2014), and have been warning about the move away from conservation toward conversion of ocean environments (Weaver and Johnson, 2012).

**ORIGINAL RESEARCH ARTICLE** Provisionally accepted The full-text will be published soon. Notify me

Front. Mar. Sci. | doi: 10.3389/fmars.2019.00158

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# Expert assessment of risks posed by climate change and anthropogenic activities to ecosystem services in the deep North Atlantic

Claire W. Armstrong (https://loop.frontiersin.org/people/531827/overview)[1*], Godwin K. Vondolia (https://loop.frontiersin.org/people/650609/overview)[2], Naomi S. Foley (https://loop.frontiersin.org/people/376887/overview)[3], Lea-Anne Henry (https://loop.frontiersin.org/people/378635/overview)[4], Katherine Needham[5] and Adriana M. Ressurreicao (https://loop.frontiersin.org/people/587587/overview)[6, 7]

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Sustainable development of the ocean is a central policy objective in Europe through the Blue Growth Strategy and globally through parties to the Convention on Biological Diversity. Achieving sustainable exploitation of deep sea resources is challenged by the huge uncertainty around the many risks posed by human activities on these remote ecosystems and the goods and services they provide.We used a Delphi approach, an iterative expert-based survey process, to assess risks to ecosystem services in the North Atlantic Ocean from climate change (water temperature and ocean acidification), the blue economy (fishing, pollution, oil and gas activities, deep seabed mining, maritime and coastal tourism and blue biotechnology), and their cumulative effects. Ecosystem services from the deep sea identified through the Millennium Ecosystem Assessment framework were presented in an expert survey to assess the impacts of human drivers on these services. The results from this initial survey were analyzed and then presented in a second survey. The final results based on 55 expert responses indicated that pollution and temperature change each pose high risk to more than 28% of deep-sea ecosystem services whilst ocean acidification, and fisheries both pose high risk to more than 19% of the deep-sea ecosystem services. Services considered to be most at risk of being impacted by anthropogenic activities were biodiversity and habitat as supporting services, biodiversity as a cultural service, and fish and shellfish as provisioning services. Tourism and blue biotechnology were not seen to cause serious risk to any of the ecosystem services. The negative impacts from temperature change, ocean acidification, fishing, pollution, and oil and gas activities were deemed to be largely more probable than their positive impacts. These results expand our knowledge of how a broad set of deep-sea ecosystem services are impacted by human activities. Furthermore, the study provides input in relation to future priorities regarding research in the Atlantic deep sea.

**Keywords:** ecosystem services, Climate Change, Anthropogenic impact, risk, deep sea, North Atlantic Ocean, Blue growth

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# Willingness to pay to protect cold water corals.
# An economic argument for inclusive ocean governance

Armstrong, Aanesen, van Rensburg and Sandorf.
Forthcoming *Conservation Biology*.

| | | Alternative 1 | Alternative 2 | Alternative 3 (no change) |
|---|---|---|---|---|
| Size of protected areas |  | 5.000 km² | 10.000 km² | 2.445 km² |
| Attractive for industry |  | Attractive for oil/gas | Attractive for fisheries | To some degree for both |
| Importance as habitat for fish |  | Not important | Important | To some degree |
| Cost per household per year to protect more cold water coral areas |  | 100 kr/year | 1000 kr/year | 0 |
| I prefer | | | | |

**Discrete choice experiment**

**Workshop and internetbased surveys**

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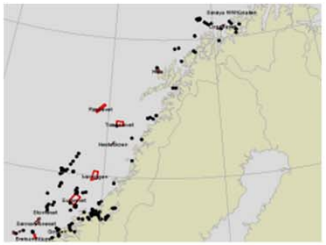
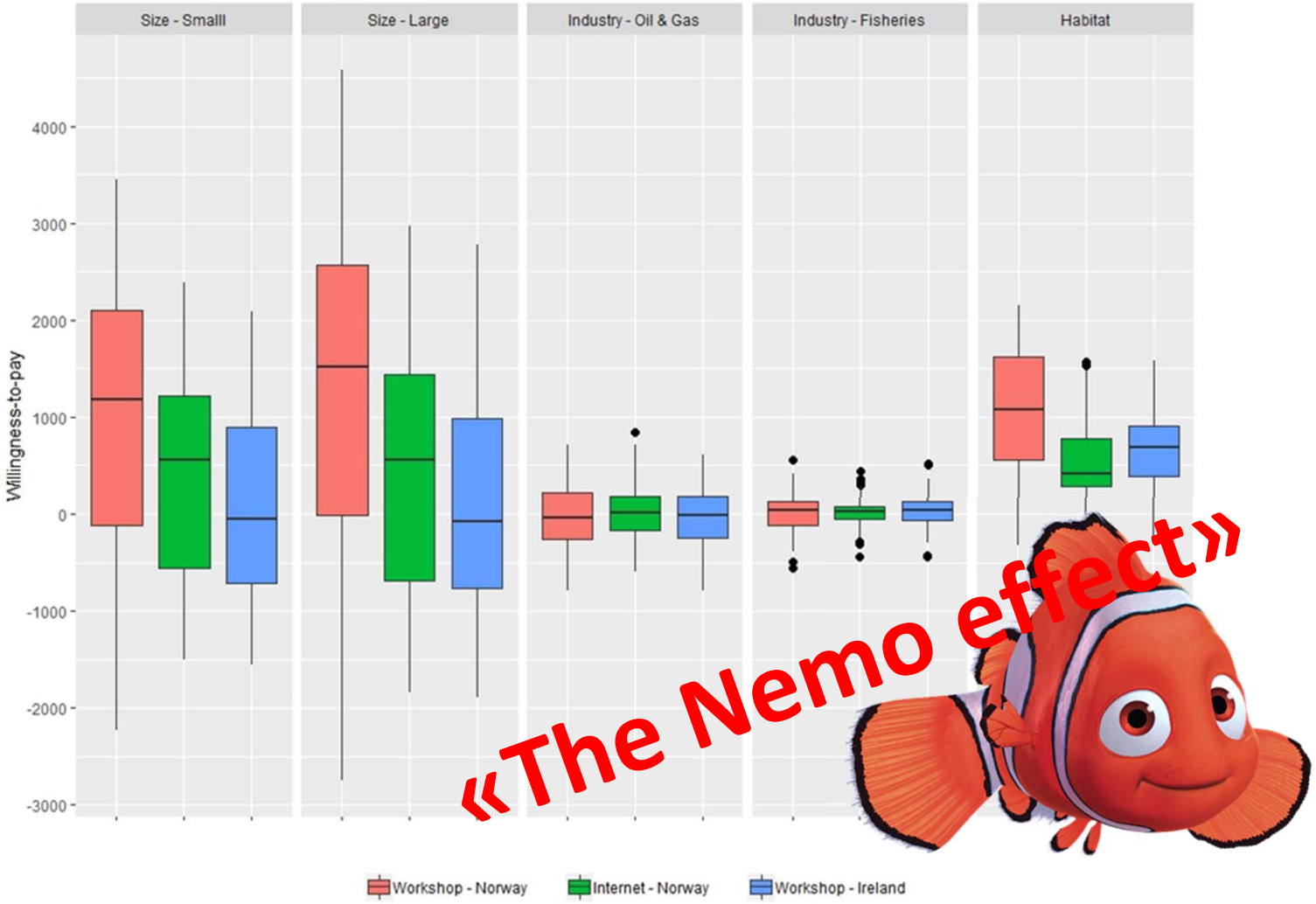
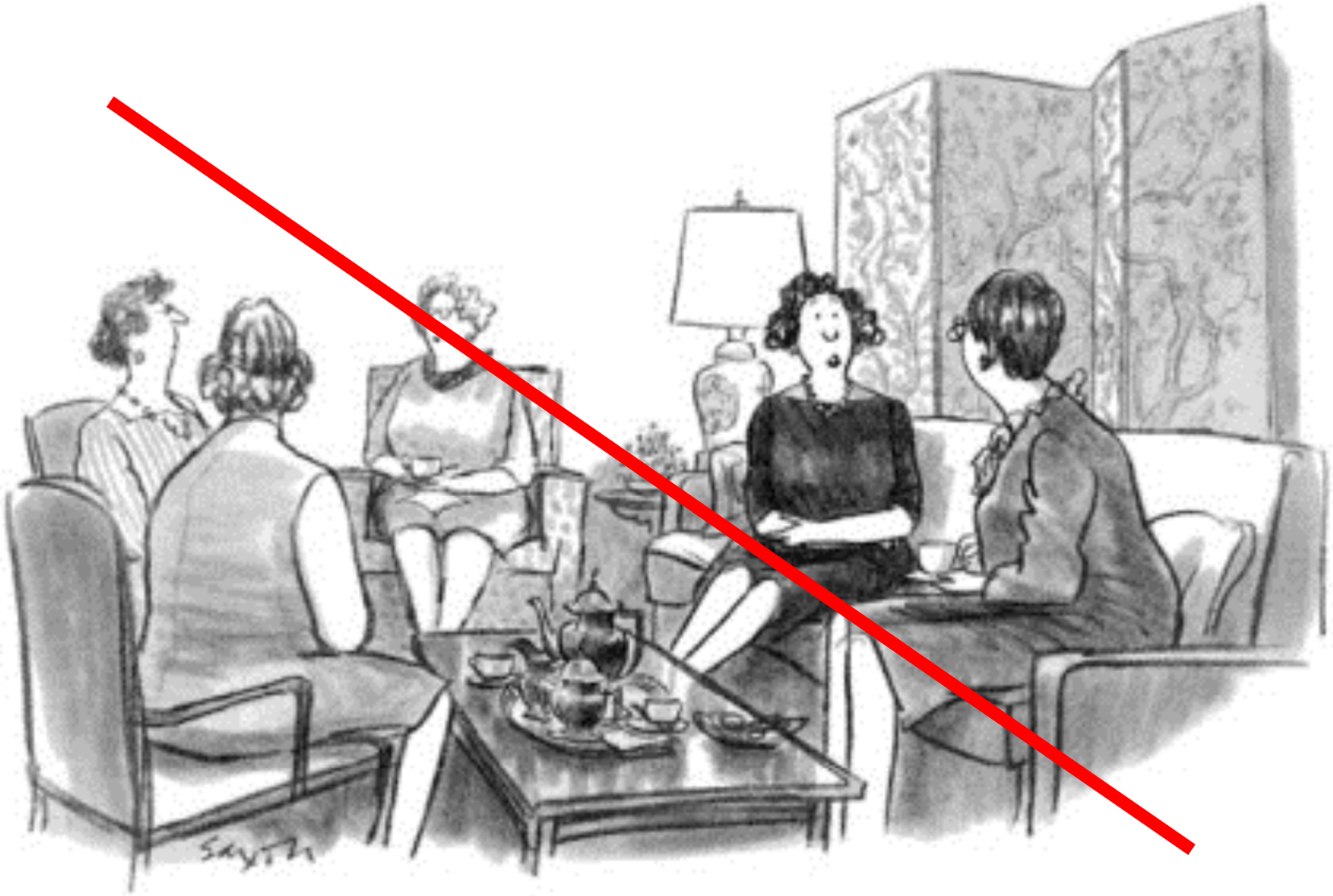







«The Nemo effect»



*"I don't know why I don't care about the bottom of the ocean, but I don't."*

# Thank You!

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Image credit: BGS